Refine Search

Search Results -

Terms	Documents
L7 and (uniform$ or single or singly) same user same interfac$3	29

Database:
US Pre-Grant Publication Full-Text Database
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US OCR Full-Text Database
EPO Abstracts Database
JPO Abstracts Database
Derwent World Patents Index
IBM Technical Disclosure Bulletins

Search: L8

Refine Search

Recall Text Clear Interrupt

Search History

DATE: Friday, July 07, 2006 Printable Copy Create Case

Set Name side by side	Query	Hit Count	Set Name result set
DB=PGPB,USPT; PLUR=YES; OP=ADJ			
L8	L7 and (uniform$ or single or singly) same user same interfac$3	29	L8
L7	L6 and (format$6 or partition$6) same (look$3 or image or view$6 or feel$3 or touch$6 or tact$6)	153	L7
L6	(pacs or picture archive communication system or ris or radiology information system) with (patient or person) same (data or information or file or segment)	372	L6
L5	L4 and user same interfac$3 same patient same (communicat$6 or connect$6)same (code or segment)	1	L5
L4	L3 and (pacs or picture archive communication system or ris or radiology information system)	187	L4
L3	wong.in.	8847	L3
L2	L1 and (pacs or picture archive communication system or ris or radiology information system)	0	L2
L1	(6363393 or 6266675).pn.	2	L1

END OF SEARCH HISTORY

Refine Search

Search Results -

Terms	Documents
L7 and (uniform$ or single or singly) same user same interfac$3	29

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L1	(6363393 or 6266675).pn.	2	L1

END OF SEARCH HISTORY

First Hit Previous Doc Next Doc Go to Doc#
End of Result Set

Generate Collection Print

L5: Entry 1 of 1 File: PGPB Jan 22, 2004

DOCUMENT-IDENTIFIER: US 20040015079 A1
TITLE: Ultrasound probe with integrated electronics

INVENTOR:
Wong, William

Detail Description Paragraph:
[0312] As previously described herein, the preferred embodiment includes a PC based design which is intuitive, has a simple graphical user interface, is easy to use and train with, which leverages PC industry know-how, robust electronics, high quality displays and low manufacturing costs. It also provides support of software controlled communications with other applications, which are embedded applications that allows patient data, scanner image, Current Procedural Terminology (CPT) code management, which is a numeric coding system by which physicians record their procedures and services, physician's plan, outcome assessment reports, all on an integrated PC. The reforms to the health care system have been applying pressure to lower costs, highlight the need for first visit/in-field diagnosis, data storage and retrieval solutions which when combined with technology innovations such as, for example, data storage and retrieval based on the Digital Imaging and Communications in Medicine (DICOM) standard, broadband and Picture Archiving and Communications Systems (PACS) drives, changes in patient record storage and retrieval and transmission, innovations in lower cost/handheld devices for ultrasound data acquisition, all which enable the preferred embodiment of the present invention. The DICOM standard aids the distribution and viewing of medical images such as, for example, ultrasound, Magnetic Resonance Images (MRIs), and CT scans. Broadband is a wide area network term that refers to a transmission facility providing bandwidth greater than 45 Mbps. Broadband systems are generally fiber optic in nature.

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L8: Entry 18 of 29 File: PGPB Nov 15, 2001

DOCUMENT-IDENTIFIER: US 20010041991 A1
TITLE: Method and system for managing patient medical records

Summary of Invention Paragraph:
[0027] Once the patient is registered, the present invention provides means for entering data into the patient's medical record. The data is in three primary forms: 1) textual records; 2) scanned records, such as EKGs and special reports; and 3) medical images, such as x-rays. With guidance from the patient-physician partnership described above, an authorized user, who may be, for example, the patient, a relative of the patient, or the patient's physician, enters textual information through an online Internet connection that interfaces with the GUIs and the web server. The web server stores in the clinical database the textual data received through the GUIs. For scanned records, the scanner (or a facsimile machine) digitally encodes the original documents and stores the encoded files in the clinical database. For medical images, which require diagnostic quality (significantly higher than the quality required for the scanned documents), the digitizer digitally encodes an original medical image in a high-resolution format file. The image server receives the file and transmits the file to the archives for storage.

Detail Description Paragraph:
[0105] As an alternative to completing forms, entering data through the Internet, and calling a telephone call center, the present invention can obtain patient demographic data directly from existing databases, such as the Radiology Information System (RIS) or Hospital Information System (HIS), depending on the systems and interfaces in operation at a particular site.

Detail Description Paragraph:
[0108] Referring to FIG. 4, the method by which medical records are entered into the patient medical record service depends on the format of the medical record. The three different formats include textual records 400, scanned records 402, and medical images 404.

Detail Description Paragraph:
[0121] FIG. 6 illustrates the method for storing non-mammography medical images into a patient medical record. First, a patient retrieves (borrows) the medical images 600 from the imaging center or physician's office 602 that owns the records. The patient then delivers the medical images 600 to operations center 100, where the studies are logged in. A technician at operations center 100 scans medical images 600, which are then displayed on image workstation 604, preferably in a DICOM (Digital Imaging and Communications in Medicine) format. The technician then tags the digitized medical images with the patient's name and UPI. With the patient preregistered, image workstation 604 queries account database 132 using the patient's name and UPI to retrieve the information necessary for completing bills.

Detail Description Paragraph:
[0128] FIG. 7b shows the acquisition, analysis, and storage of mammograms for an imaging center 106 that has a digitizer 122 but no CAD system. In this scenario, a technician at imaging center 106 performs the mammography study and produces the hard copy mammograms 700. The technician then immediately digitizes the hard copy

mammograms 700 with digitizer 122, preferably in a DICOM format. The digitized images appear on image workstation 604. The technician then tags the digitized medical images with the patient's name and UPI. With the patient preregistered, image workstation 604 queries account database 132 using the patient's name and UPI to retrieve the information necessary for completing bills. Image workstation 604 then forwards the digitized images through an image center NAD 710 and an operations center NAD 702 to image server 126. Image server 126 then sends the images for long term storage to expanded memory image archive 105 through NAD 702.

Detail Description Paragraph:
[0131] As shown in FIG. 7c, a technician at imaging center 106 performs the mammography study and produces hard copy mammograms 700. The technician immediately digitizes the hard copy mammograms 700 with digitizer 122, preferably in a DICOM format. Image workstation 604 displays the digitized image while, simultaneously, CAD system 124 marks problematic areas in the images for further evaluation by an interpreting radiologist, who generates a report if necessary. The technician then tags the digitized medical images with the patient's name and UPI. With the patient preregistered, image workstation 604 queries account database 132 using the patient's name and UPI to retrieve the information necessary for completing bills. Image workstation 604 then forwards the digitized images and report, if generated, through an image center NAD 710 and an operations center NAD 702 to image server 126. Image server 126 then sends the images and report, if generated, for long term storage to expanded memory image archive 105 through NAD 702. Preferably, before forwarding the images, image server 126 performs quality assurance checks on the images to verify diagnostic quality.

CLAIMS:

7. The method of claim 1, wherein the step of electronically storing the medical images comprises scanning the medical images into a high-resolution format file.

10. The method of claim 1, further comprising marking portions of the text information, the files of the paper documents, and the files of the medical images as critical information that is needed in an emergency situation, and wherein the step of providing an authorized user with access comprises displaying the critical information on a single graphical user interface.

19. The method of claim 18, wherein the step of scanning the medical images into the digitized images comprises displaying the digitized images on an image workstation and storing the digitized images in a DICOM format.

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L8: Entry 23 of 29 File: USPT Jun 3, 2003

DOCUMENT-IDENTIFIER: US 6574629 B1
TITLE: Picture archiving and communication system

Brief Summary Text (25):
In other embodiments, the PACS display comprises a toolbar that is displayed concurrently with medical images. The toolbar includes a plurality of action buttons which affect image display. In these embodiments, the form includes options affecting where on the display screen the tool bar is displayed and a format of the toolbar, in addition to options for selecting which action buttons will be displayed in the toolbar.

Detailed Description Text (11):
Also included in workstation 10 are display interface 29, keyboard interface 30, mouse interface 31, computer bus 32, RAM 34, processor 36, printer interface 37, and possibly disk drive interface 39 and CD-ROM drive interface 40. Processor 36 comprises a microprocessor (the type of which varies depending upon the station, as described below) for executing the applications and PACS software modules out of RAM 34. In this regard, RAM 34 can comprise several memory devices. The applications and PACS software are preferably stored in memory 21, as noted above. Alternatively, however, applications may be stored on a floppy disk in disk drive 19 or a CD-ROM in CD-ROM drive 20. In this case, processor 36 accesses these applications (or other data) stored on a floppy disk via disk drive interface 39 and accesses applications (or other data) stored on a CD-ROM via CD-ROM drive interface 40. Application execution and other tasks of workstation 10 may be initiated using keyboard 16 or mouse 17, commands from which are transmitted to processor 36 via keyboard interface 30 and mouse interface 31, respectively. Output results from applications running on workstation 10 may be processed by display interface 29 and then displayed to a user on display 14. To this end, display interface 29 preferably comprises a display processor for forming images based on data provided by processor 36 over computer bus 32, and for outputting those images to display 14. Rather than including a separate display processor, the functionality of display processor 36 may be implemented by processor 36. Output results from the PACS software modules, e.g., medical images, may also be output to network printers, such as those described below in section 1.6.7. To this end, processor 36 executes print driver 25 which performs appropriate formatting of the output results prior to their transmission.

Detailed Description Text (26):
Among the other services provided by the network gateway is RIS validation. RIS validation ensures integrity of patient demographic information in the studies. To this end, the network gateway captures and stores studies in a private cache located, e.g., in a hard disk on the network gateway, so that key demographic information (e.g., patient identification, accession number, etc.) can be validated based on pre-stored information, as described in more detail below.

Detailed Description Text (35):
The reviewing stations provide users with the ability to view one or more such selected studies in a variety of different, selectable display formats, and then to print or transmit the studies using a displayed tool bar. With regard to viewing the studies, the reviewing stations may be modality-specific as is the case in FIG.

1. Therefore, they may have modality-specific viewing options, including, but not limited to, CT scout mode, MR cursor mode, image zoom, CINE loop, and image drag and drop features, all of which are described below. The viewing options also may include the ability to display multiple studies for the same patient on a single reviewing station. Flexible controls are generally provided for navigating through the larger studies. The invention also provides a way to customize the main study window and tool bar based on a user profile. Other options provided on the reviewing stations include the ability to access RIS reports and to create summary series folders for a patient, which summary series folders comprise selected patient images from one or more studies.

Detailed Description Text (41):
PACS broker 46, also referred to herein as the RIS gateway, provides an orderly, unified view of RIS 44 to the PACS core components, referring physician or clinical stations, a diagnostic center (e.g., the AGFA.RTM. Diagnostic Center, or "ADC"), and a transmitting station. Specifically, PACS broker 46 is a stand-alone platform that listens to the RIS and responds to query/retrieve statements from the PACS core components by accessing appropriate data from the RIS. To this end, PACS broker 46 is able to communicate in HL-7 ("Health Level 7") with the RIS, and to communicate in DICOM with network gateway 6. Thus, the PACS broker makes patient demographics, schedules, study parameters, and reports on the RIS available to the core PACS components. A PACS broker, or its equivalent, is therefore generally used if image/study routing is to be performed by the network gateway based on referring physician or patient location. Moreover, the PAC broker can be programmed to update patient information in the core components periodically, thereby ensuring that the PACS has the latest patient information available.

Detailed Description Text (44):
As noted above, one of the advantages of the present invention is the ability to access images/studies from remote locations, such as over the Internet. To this end, the present invention provides Web server 47 for making information on the Internet available to the PACS, and vice versa. Of course, standard security protocols are provided in Web server 47 to prevent unauthorized persons from gaining access to information stored on the PACS.

Detailed Description Text (46):
Web server 47 can be configured as a client of database server 2 (i.e., as a core component) or as a stand-alone system (i.e., as an extension). In either case, in response to a request from the PACS or the Internet, Web server 47 retrieves studies (or other information) from either the PACS or from the Internet in accordance with the request. The Web server then places those studies (or other information) into its cache, which is preferably scaleable to meet the storage needs of the system. Web server 47 may then provide either full-size images of those studies or thumbnail sketches thereof to the requester. Storing the images on the Web server in FlashPix.RTM. format (developed by the Digital Imaging Group) is one way for the Web server to provide ready access to either thumbnail or full-size images.

Detailed Description Text (49):
Referring physician stations are loaded with RP5, and generally comprise single monitor workstations designed for referring physicians home/office use (as opposed to primary viewing). In this regard, RP5 software comprises PC-based DICOM "query/retrieve/display/report/print" software that can be loaded onto any suitably equipped workstation. Version 1.X of RP5 is a 16-bit application which runs on a variety of operating systems including Windows95.RTM. and Windows.RTM. 3.11. Version 2.X of RP5 is a 32-bit application that runs on Windows95.RTM. and Windows.RTM. NT. The 2.X version of RP5 is preferred, since it has an improved user interface and image processing enhancements, including JPEG compression.

Detailed Description Text (94):

Show Report button 135 permits a user to retrieve, and to display on his station, a patient report from the HIS or RIS. As described above, in order to obtain information from the HIS or RIS, a PACS broker (i.e., RIS gateway 46) is typically required on the PACS. Accordingly, the show report button is generally only included in PACS that include a PACS broker. Of course, the show report button may also be used in cases where the PACS is connected to the HIS/RIS via means other than a PACS broker.

Detailed Description Text (96):
FIG. 13 shows a representative example of the study information form displayed by button 136. As shown, study information form 137 includes entries for patient ID, name, sex, location, study ID, date, time, station, accession number, procedure, modality, physician, reported status, study status, specialty, private field, comments, reason, and keywords (user-assigned word(s) for identifying a study quickly from a list of studies). Also included in the form are action buttons. In this regard, button 139 saves comments and changes to the patient study information; button 140 closes the study information window; and button 141 performs RIS validation, meaning that it inserts the actual patient ID and accession number into the study. In this regard, in trauma cases in particular, a study may be forced into the PACS without going through RIS validation. When this is done, the invention inserts a UID (i.e., "unidentified") string for the patient ID. Button 141 thus substitutes the patient's ID for the UID string.

Detailed Description Text (105):
HIS window button 171 permits a user to open a "telnet" session between the PACS and the HIS/RIS via the PACS broker, database server, and network gateway. During this telnet session, the user may view requested patient information and RIS events, preferably in real-time. This button is typically provided on the reviewing stations, but may be available on other PACS stations as well.

Detailed Description Text (108):
Custom query button 175 enables a user to query for patient images, studies and/or folders on the PACS. When activated, the custom query button displays a form, which the user may fill out in order to specify attributes of images, studies and/or folders stored on the PACS that the user wants to retrieve. FIG. 16 depicts the form displayed by clicking on custom query button 175. On this form, the user may enter a range of search dates, times, patient information, RIS procedure codes, or other relevant information on which to base the custom query. Similarly, the user may initiate location sorting by activating location sorting button 178; status sorting by activating status sorting button 177, and modality sorting by activating modality sorting button 176. The sorting effected by these buttons is substantially identical to that described below. Once the relevant information has been set in custom query form, searching may be initiated by clicking on search button 179. Thereafter, images, studies and/or folders which match the search criteria are retrieved and displayed in the study list. Clear search criteria button 180 is also provided in the custom query form to clear existing entries, and exits close button 181 from the custom searching function.

Detailed Description Text (126):
Once images have been selected from the main study list, the images may be displayed on a PACS station. Accompanying the display of such images is a toolbar which enables a user to edit, manipulate, and view the images. This toolbar is implemented and controlled by PACS software modules running on each PACS station. FIG. 17 shows an example of such a toolbar. As shown, toolbar 200 is divided into four major sections that allow the user to view and to act on images. The four major sections of the toolbar comprise worklist section 201, format selection section 202, image manipulation section 203, and virtual screen 204.

Detailed Description Text (131):
Format section 202 of the toolbar contains buttons 226 for selecting a display

format for patient images. Additional action buttons 227 in this section enable display annotation, comparison, marking of a study for dictation, creating a summary series, displaying HIS/RIS reports, and exiting the display. In addition, tab buttons 229 enable a user to tab through displayed images based on pre-set image tabs. In this regard, the present invention provides a way to set tab stops in displayed images. Specifically, the invention permits a user to point and click on displayed images at points where tab stops are to be set. When instructed, e.g., by clicking on a "save" action button, the invention stores these tab settings in its local cache, together with the displayed images (as noted, displayed images are typically displayed from a reviewing station's local cache). These tab setting can later be modified or deleted simply by calling-up a form on which they are stored.

Detailed Description Text (132):
Included within action buttons 227 is study display format button 230 which toggles between different study display formats. In the present invention, there are preferably three options: one study per monitor, one study spans two monitors, and on study spans four monitors. The action button displayed indicates that one study spans two monitors (hence the use of two "monitors" on the button). Clicking on that button causes the display format to change, hence the use of "toggle". Action button 231 enables a user to select images within an exam and to save them as a separate series of images. Action button 232 enables a user to save changes in the display. Action button 233 enables a user to mark studies for dictation. This button toggles between three states, preferably: "off", in which the study has a "new" status and is therefore ready for dictation (this is shown); "dictation in process" which indicates that the study is currently being dictated; and "dictation complete" which indicates that dictation for the study has been completed. Action button 234 enables a user to display one series of images on a left monitor (e.g., the left half of a display screen) and another series on the right monitor (e.g., the right half of a display screen), The button toggles between the "AA" position (as shown), where the same series spans two viewing monitors, and the "AB" position (not shown), where different series span the two viewing monitors. Action button 235 allows the user to display a report form for a current study. Action button 236 allows the user to display an annotation for a displayed image. Action button 237 allows a user to set whether toolbar inputs are to affect only a single image or all images in a series or study of images. Action button 239 allows a user to exit from the display mode and return to the main study list. Finally, action button 240 comprises the process monitor, which allows the user to open a form wherein the user can check the status of transmit, receive, and print jobs.

Detailed Description Text (134):
FIG. 21 shows the preferred format of the process monitor form noted in sections 3.1 and 4.2 above. As shown in the figure, the process monitor form includes two rows of action buttons, which allow the user to control queue activity of stations in the PACS. The top row of action buttons allows a user to halt local queues, restart local queues, delete unwanted or stuck print jobs, increase or decrease the priority of selected print jobs, and retry printing of jobs that have failed or that are stuck in "printing in progress" status. The second row of action buttons provides different selection criteria which facilitate image viewing.

Detailed Description Text (139):
Virtual screen section 204 of toolbar 200 is a simplified map of how each of the video screens is being used to display a series of images. FIG. 22 shows an example of the use of virtual screen section 204. In that example, four images span across both screens, while the remaining images are represented by thumbnail images 256. In this regard, the two large squares 259 and 260 at the top of the virtual screen are called screen models. If a study has multiple images, then there will be additional icons displayed, called cells, as shown in the figure. The virtual screen section and the format selection section may be used together to create image layouts on a reviewing station's display screen.

Detailed Description Text (140):
More specifically, FIG. 23 shows how virtual screen section 204 is used to set the format of the display. In this regard, the display format shown is "four-on-one stack mode", and the first series of images "1" is highlighted. Clicking on any of the cells together toggles their selection status. Clicking "+" button 261 selects all series that are displayed in the virtual screen; and clicking "-" button 262 de-selects all selected series displayed in the virtual screen. Series locations can be exchanged merely by selecting a series and dragging and dropping that series to a new location. The invention also provides an "MR cursor mode" (described below), whereby when an MR study is displayed, and the user may navigate through images in studies displayed on the virtual screen by using a single image as a reference.

Detailed Description Text (143):
Starting with window and level tab 263, after that tab is selected, several action buttons are displayed, together with a greyscale bar with numeric window and level readouts. This configuration is shown in FIG. 17. In the present invention, several different functions may be invoked via window and level tab 263. More specifically, clicking on button 280 displays the numeric window level values shown in the figure. Clicking on button 272 magnifies displayed image by a predetermined factor which is based on the number and type of clicks thereon. Clicking on button 273 brings the system into MR cursor mode. In this regard, MR cursor mode permits the user to navigate through MR images according to each individual image slice or to view all slices at once. In preferred embodiments of the invention, there are three display formats. These include four-on-one stack mode, whereby there are four slices per screen; nine-on-one stack mode, whereby there are nine slices per screen; and traditional sixteen-on-one strip mode, whereby there are sixteen strips per screen.

Detailed Description Text (158):
Clicking on the user profile tab displays the user profile form shown in FIG. 31. As shown, the user profile form is divided into several sections, whereby a user can customized the main study window and/or display toolbar. These sections include available study management features section 350 for selecting action buttons to appear in the main study window by clicking thereon; user choices section 351 for setting a sign-in mode and encoding patient names; default view criteria section 352 for sorting and selecting criteria in the main study window; worklist criteria section 353 for selecting features of the worklist; available display features section 354 for selecting action buttons and tabs in the display toolbar; tool bar section 355 for selecting a location of the toolbar on screen; startup tab section 356 for setting startup tabs in the toolbar; user choices section 357 for setting miscellaneous display defaults and measurement units, which includes displaying a patient's information form and prior RIS reports as defaults; and modality setup section 358 for selecting modalities for which formats and features are to be set.

Detailed Description Text (163):
User choices section 357 creates default settings that affect display and print behavior. In particular, button 387 enables/disables display of DICOM header information with an image; button 388 enables/disables display of a listing of summary series in the main study list; button 389 separates images so that color images are sent to a color printer and black-and-white images are sent to a black-and-white printer (of course, this will not work unless both types of printers are attached to the PACS); button 390 sets default print mode (i.e., color or black-and-white); button 391 causes the PACS to use the print criteria contained in a DICOM print service object that is associated with each study; button 392 automatically opens a patient information form upon display of a study; and button 393 automatically displays a patient's prior reports each time a new study is displayed. Other buttons may be included as well to place the user at the main study list following login (preferably used in reviewing stations); to launch display of selected images (e.g., images in a worklist) immediately following

login; and to cause the patient's name to be encoded in the main study list. This last button assures the patient's privacy.

Detailed Description Text (166):
Format selection list 401 shows available image formats for the various imaging modalities. Examples of such formats are described in section 4.2 above. The preferred embodiment of the invention permits the user to select, for the toolbar, up to five different formats per modality from the choices provided in 402; although the invention is not limited to this. The five selected display formats are then displayed in format list 401 on the user profile form. Finally, the user profile form allows the user to select gamma and alpha correction factors for each imaging modality via entry lines 403 and 404, respectively.

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L8: Entry 27 of 29 File: USPT Jul 10, 2001

DOCUMENT-IDENTIFIER: US 6260021 B1
TITLE: Computer-based medical image distribution system and method

Abstract Text (1):
This invention relates to an object-oriented system and method for easily and rapidly distributing medical images from existing picture and report storage systems to a plurality of heterogeneous client workstations. The system includes one or more interface engines, for providing image objects with uniform structure regardless of the type of existing system on which they are stored, and image server middleware, for managing the distribution of image objects. The system also includes a security object server, for authorizing user access to the image distribution system and to particular objects, a personalization object server, for providing user interface preferences and client workstation capabilities, and a web server, for downloading initial access pages and user interface components. The system implements a method for medical image distribution according to which image data stored in existing picture storage systems is first converted into a uniformly structured image objects before being composed for downloading to client workstations for user viewing. The system and method of this invention are easily extensible both for added function and for added performance. The system and method of this invention are preferably implemented according to CORBA standards.

Brief Summary Text (10):
Similarly text interpreting medical image and associated patient information is being transcribed into or captured directly in digital form and stored on server systems (generically named Radiology Information, or "RI", systems). RI systems, like PAC systems, are also usually designed as client-server, or two-tiered, systems with user workstations running specific client software that interacts only with specific server software on the RI system.

Brief Summary Text (15):
One approach to solving these incompatibilities is standardization of messages or interfaces. However, standardization alone is at best only a partial solution to solving system incompatibilities and to providing uniform data access. For example, the Digital Imaging and Communications in Medicine ("DICOM") is one standard relevant to medical image distribution. DICOM has been developed and promoted by the American College of Radiology/National Equipment Manufacturers Association (ACR/NEMA), and aims to standardize formats for exchange of image data in PAC systems by defining a standard set of basic and composite data types along with a standard set of requests involving those data types, all of which are representative of the imaging activities in a radiology department. Accordingly, a single workstation with a DICOM-conforming client can expect some success in accessing multiple PAC systems, also DICOM-conforming, and the multiple DICOM-conforming PAC systems can themselves expect some success in exchanging image data. Individual variations in the details of DICOM-conformance may defeat interoperability or data interchange.

Brief Summary Text (16):
A similar standard applicable to RI systems is HL7, a standard that aims to define formats for electronic data interchange in health-care environments, In particular, HL7 defines message formats for exchange of information relating to a broad range

of health-care activities, including patient admissions, discharges, transfers, patient queries, billing, clinical observations, and orders, and eventually patient medical records generally. Because of such broad goals, HL7 is even less of a true "plug-and-play" standard than is DICOM. In other words, two systems, although conforming to HL7, are likely, nevertheless, not be able to exchange requests and data. Therefore, a single user may still require multiple clients in order to access multiple RI systems, even though they are all HL7 conforming.

Brief Summary Text (21):
It is an object of the present invention to provide a solution to the above problems of the incompatibilities of existing PAC and RI systems and of lack of uniformity of access to their stored image data. This object is achieved by novel and innovative application of computer middleware technologies to create a three-tiered information system architecture. The resulting system achieves surprising benefits, including scalability in performance and in function. Hardware can easily be added or removed to achieve necessary performance at low cost; additional processing modules can be easily added to achieve uniform access to additional image data formats, or even to additional health-care client-server systems.

Brief Summary Text (22):
The middleware software of the present invention which processes data and requests to existing PAC and RI systems into a common format and structure. Medical images and associated medical information, and indeed general patient data, can then be made uniformly available to user workstations. A single workstation can access data from a diverse range of prior-art PAC and RI systems by running single client software which need only interact with the provided common format and structure. Further, existing PAC and RI systems can efficiently exchange data through the medium of this common format and structure.

Brief Summary Text (23):
Generally, the system includes one of more interface engines, for providing image objects with uniform structure regardless of the type of existing system on which they are stored, and image server middleware, for managing the distribution of image objects. The system also includes a security object server, for authorizing user access to the image distribution system and to particular objects, a personalization object server, for providing user interface preferences and client workstation capabilities, and a web server, for downloading initial access pages and user interface components. The system implements a method for medical image distribution according to which image data stored in existing picture storage systems is first converted into a uniformly structured image objects before being composed for downloading to client workstations for user viewing. The system and method of this invention are easily extensible both for added function and for added performance. The system and method of this invention are preferably implemented according to CORBA standards.

Brief Summary Text (24):
In a first embodiment, this invention includes a medical image distribution system for distributing medical images from one or more existing storage systems to a plurality of network-attached client workstations, said medical image distribution system comprising one or more computer systems, and wherein each said network-attached client workstation is configured with an object-oriented graphical interface for receiving medical image requests from a user and for displaying medical image objects to the user; and wherein said one or more computer systems are configured with one or more interface engines, each said interface engine for retrieving medical image data from one or more existing storage systems and for presenting retrieved medical image data as medical image objects with a uniform object-oriented structure, and one or more image object coordinators for receiving medical image requests transmitted from one of said graphical interfaces, for obtaining medical image objects in said uniform object-oriented structure from said one or more interface engines, for composing said medical image objects for display

by said graphical interface, and for transmitting said composed medical image objects to the requesting graphical interface.

Detailed Description Text (13):
Also attached is CORBA Image Interface Engine ("CIIE") 32, which interfaces between the PAC system and medical image server 12. Interface engine 32 functions as a server of image objects with IDL defined interfaces, which are the uniform for all attached PAC systems. Upon receipt of a client image object request transferred, for example, according to the CORBA/IIOP protocol, the CIIE implementation translates it into an equivalent PAC system request, perhaps formatted in a DICOM compliant manner. Upon receipt of the PAC image data or response, the CIIE implementation formats it according to the defined IDL interface into a response to the client object, which is transmitted according to the CORBA/IIOP protocol over links 34. In this manner, the specialized details of the PAC system are hidden from a client, which sees only uniform image object interfaces accessible by standard CORBA/IIOP protocols regardless of the details of the PAC system, such as whether it is DICOM compliant or not. The CIIE maps the IIOP protocol onto the DICOM conformant interfaces, or other proprietary interfaces, of the PAC system.

Detailed Description Text (14):
Also present as part of the exemplary medical image system is RI system 18. This system also communicates over links 20 to attached workstations, such as workstation 22, in a manner which is optionally be HL7 compliant. Also attached to RI system 18 is CORBA Report Interface Engine ("CRIE") 24, which performs a similar function for the RI system as CIIE 32 performs for the PAC system. In particular, CRIE interface engine 24 functions as a interface for report objects with IDL defined interfaces, which are uniform for all attached PAC systems, and which are accessible according to the standard CORBA/IIOP protocol. Accordingly, the specialized details of the RI system are hidden from a client object, which sees only uniform report object interfaces regardless of the details of the RI system, such as whether it is HL7 compliant or not. In detail, upon receipt of a client report object request transferred according to the CORBA/IIOP protocol, the appropriate CRIE implementation translates it into an equivalent RI system request, perhaps formatted in a HL7 compliant manner, and upon receipt of the RI report data or response, the CRIE implementation formats it according to the defined IDL interfaces into a response to the client object, which is transmitted according to the CORBA/IIOP protocol over links 34.

Detailed Description Text (16):
Returning to FIG. 1, the remaining components of the exemplary system therein illustrated are now described in more detail. Master Patient Index ("MPI") system, is a middle-tier system, preferably present in order to obtain relevant patient identifiers for use in the system of the present invention. Each existing first-tier PAC and RI system typically implements patient identifiers which are unique and specific to that system. Medical image server 12 may implement and require another form of patient identifiers. Finally, health-care personal using the medical image server system usually easily identify patients in terms of name along with certain demographic characteristics instead of with details of the patient identifiers maintained by the various systems having patient information of interest. MPI system 40 is an object-based middleware server present in a system of this invention to translate between these forms of patient identification. Although this invention is adaptable to any MPI system providing such function, in a preferred embodiment, MPI system 40 implements interfaces defined by the OMG/CORBAmed Patient Identification Services ("PIDS") and Master Patient Index IDL standard (available from the OMG).

Detailed Description Text (27):
As described above, CIIE 32 and CRIE 24 are interface engines which present an object-oriented interface to existing first-tier PAC and RI systems. Accordingly, their object implementations receive and respond to client object requests,

principally from the image object coordinator, using CORBA/IIOP protocols between the system ORBs in the middleware server computer systems. The interface engines communicate with the existing systems in their own, perhaps proprietary, message or command formats. However, for PAC systems, communication is preferably conformant to the DICOM standard, and for RI systems, the HL7 standard. There may be one or more of each of the interface engines in an image server system.

Detailed Description Text (31):
The remaining elements of the middleware software architecture are MPI (master patient index) 40 and web server 56. As described above, the MPI is a, preferably CORBAmed standardized, object server that provides unique patient identification needed for accessing existing first-tier systems. When image object coordinator 54 is presented with a user request for image or report data for an identified patient, it may optionally need to access MPI 40 to translate the patient identification provided by the user into unique patient identification understandable by attached PAC or RI systems.

Detailed Description Text (50):
Otherwise, at step 134, the image object coordinator checks the user-supplied patient identification for adequacy. If it is inadequate, the MPI is consulted at step 136 in order to attempt to determine adequate patient identification for the first-tier PAC or RI systems storing the desired image data. If adequate patient identification is not determined after one or more attempts, perhaps including requests to the user for additional patient information, then an error indication is returned to the client workstation at step 134.

Detailed Description Text (52):
At step 140, the image object coordinator composes the returned image data into formats and resolutions defined by the personalization object server for this particular user and this particular client workstation.

CLAIMS:

1. A medical image distribution system for distributing medical images from one or more storage systems for medical images to a plurality of network-attached client workstations, said medical image distribution system comprising one or more network-attached computer systems, and

wherein each said network-attached client workstation is configured with a graphical interface for receiving medical image requests from a user, for transmitting the received medical image requests in an object-oriented format, and for displaying medical image objects received in response to the transmitted requests to the user; and

wherein said one or more network-attached computer systems are configured with

infrastructure modules of a distributed object system for forwarding and transmitting of object requests and responses,

one or more interface engines, each said interface engine presenting a uniform object-oriented interface for retrieving medical image data from the existing storage systems by translating requests between the uniform object-oriented format and individual formats recognized by the storage systems and for returning retrieved medical image data as medical image objects in the uniform object-oriented structure, and

one or more image object coordinators for receiving the object-oriented medical image user requests transmitted from said client workstations, for obtaining objects with requested medical images by forwarding retrieval requests in the uniform object-oriented format to said one or more interface engines, for composing

said obtained medical image objects according to preferences of the user and capabilities of the client workstation for display at the client workstations, and for transmitting said composed medical image objects to the requesting client workstation as a response to the transmitted object-oriented user requests.

2. The system as claimed in claim 1, wherein said one or more computer systems are further configured with

one or more report interface engines, each said report interface engine presenting a uniform object-oriented interface for retrieving medical report data associated with said medical image data from the existing storage systems by translating requests between the uniform object-oriented format and individual formats recognized by the storage systems and for returning retrieved medical report data as medical report objects in the uniform object-oriented structure, and

wherein said one or more image object coordinators further receive object-oriented medical report user requests associated with said medical image data transmitted from the client workstations, obtain objects with requested medical reports by forwarding retrieval requests in the uniform object-oriented format to said one or more report interface engines, compose said obtained medical report objects according to preferences of the user and capabilities of the client workstation for display at the client workstations, and transmit said composed medical report objects to the requesting client workstation as a response to transmitted object-oriented user requests.

9. The system as claimed in claim 8, wherein said one or more computer systems are further configured with one or more cardiology interface engines, each said cardiology interface engine presenting a uniform object-oriented interface for retrieving cardiology image data from the existing storage systems by translating requests between the uniform object-oriented format and individual formats recognized by the storage systems and for returning retrieved cardiology image data as cardiology image objects in the uniform object-oriented structure.

10. The system as claimed in claim 9, wherein said one or more computer systems are further configured with one or more cardiology image object coordinators for receiving object-oriented cardiology image user requests transmitted from said client workstations, for obtaining objects with requested cardiology images by forwarding retrieval requests in the uniform object-oriented format to said one or more cardiology interface engines, for composing said obtained cardiology image objects according to preferences of the user and capabilities of the client workstation for display at the client workstations, and for transmitting said composed cardiology image objects to the requesting client workstation as a response to transmitted object-oriented user requests.

11. The system as claimed in claim 9 further comprising a middleware database for storing persistent data comprising definitions of said uniform object-oriented formats of said cardiology image objects.

13. The system as claimed in claim 12 wherein said middleware database data further comprises definitions of said uniform object-oriented formats of said medical image objects.

20. A method for medical image distribution by one or more network-attached computer systems from one or more storage systems for medical images to a user at a network-attached client workstation comprising:

receiving a user request at a client workstation for a medical image,

transmitting the received user request for the medical image in an object-oriented format from the client workstation to an image object coordinator at the one or

more network-attached computer systems,

forwarding a retrieval request for the requested medical image in a uniform object-oriented format from the image object coordinator to an interface engine at the one or more network-attached computer systems,

retrieving the requested medical image data for the requested medical image by the interface engine from one of said existing storage systems, wherein the retrieving further comprises translating requests between the uniform object-oriented format and individual formats recognized by the storage systems,

composing medical image objects received by the image object coordinator from the interface engine in the uniform object-oriented format according to preferences of the user and capabilities of the client workstation,

transmitting said composed medical image object by the image object coordinator to the client workstation as a response to the transmitted object-oriented user request, and

displaying by the client workstation of said transmitted composed medical image objects to the user.

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